

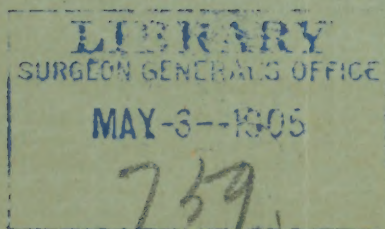
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ENGELMANN (G.J.)

Menstruation and the Removal
of Both Ovaries.

BY

GEORGE J. ENGELMANN, A.M., M.D.,
ST. LOUIS, MO.

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of the Author.*

MENSTRUATION

AND THE

REMOVAL OF BOTH OVARIES.

BY

GEORGE J. ENGELMANN, A.M., M.D.,

PROF. DISEASES OF WOMEN AND OPERATIVE MIDWIFERY, MISSOURI MEDICAL COLLEGE; LATE

PROF. OF DISEASES OF WOMEN, ST. LOUIS POST-GRADUATE SCHOOL OF MEDICINE;

PRESIDENT OF THE ST. LOUIS OBSTETRICAL AND GYNECOLOGICAL SOCIETY;

PRESIDENT OF THE SOUTHERN SURGICAL AND GYNECOLOGICAL

ASSOCIATION; FELLOW OF THE AMERICAN GYNE-

COLOGICAL SOCIETY, OF THE BRITISH

GYNECOLOGICAL SOCIETY, ETC.

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MENSTRUATION AND THE REMOVAL OF BOTH OVARIES.

BY GEORGE J. ENGELMANN, M.D.,
St. Louis, Mo.

IN the discussion of this question we must distinguish between menstruation proper—a regular recurrence of the monthly flow, continuing steadily, with all the characteristics of menstruation until the time of the natural menopause—and uterine hemorrhages as they occur after operations on the pelvic viscera, especially after laparotomy, and also after the menopause; these *bleedings* after the removal of both ovaries, which vary in cause and character, have all been promiscuously thrown together *as menstruation*. In some cases we may not be able to demonstrate the cause of the flow with positive certainty: in others we can do so, and, if a post-mortem examination were possible, satisfactory anatomical explanations would always be found. First of all, we have those bleedings which occur during and soon after the operation, with more or less regularity, gradually diminishing, to cease entirely after a few months, or, less often, years. Then again, there is a class of cases, perhaps more frequent, in which a period of quiescence follows the removal of the ovaries, but a *bleeding, called menstruation* by some, appears after from three to six months, reappearing at intervals of three or four weeks, with perhaps a severe attack of flooding now and then, to cease in the course of a year or two, a condition resembling the frequently prolonged period of the change of life. As I have said, these bleedings have been called menstruation by some who have been satisfied with

the vague explanation of *habit*. A certain impulse does exist, but it is not habit; it is a remnant of nerve influence, emanating from ganglia or nerve-stumps—that nerve influence upon which so much stress is placed by Johnstone; in cases in which this *seems* to explain the bleeding a cause will be found in the uterus which favors the occurrence of hemorrhage, and if this does not exist, we would, I am certain, upon investigation, find a temporary activity of ovarian remnants: a tangible explanation exists for all regularly recurring bleedings. Irregular bleedings soon after the operation are readily explained by the nerve irritation and the disturbance in the circulation through the cutting out of important circles, or by the lingering activity of ovarian remnants, which are gradually destroyed either by absorption or the imbedding within inflammatory deposits.

The third ovary, which has served to explain many of the peculiar phenomena, unquestionably of ovarian origin, which have been observed to follow double ovariectomy or oöphorectomy, is so rare that I hope this reasoning is forever dispelled, like a shadowy mist beneath the clear rays of the sun, by the new light which pathological anatomy and microscopy have cast upon this hazy subject.

The possibility of menstruation or pregnancy after double ovariectomy was denied by some, and asserted as a fact by other equally conscientious and scientific observers: oöphorectomy was denounced as a useless operation on account of an occasional failure to produce the menopause, or to relieve the supposed ovarian pain. The operation was denounced because it had not relieved these patients; the operation was rashly condemned as impotent to accomplish the purpose designed, on account of apparently well-authenticated cases of the continuance of menstruation, or the occurrence of pregnancy, after oöphorectomy and double ovariectomy. The truth of these statements, the possibility of their occurrence, was doubted by some; by others the third ovary was suggested as a solution of the mystery. Wordy wars ensued: theories and counter-theories were advanced and rejected:

and in very few of the cases cited were the facts fully established, or was the *corpus delicti* properly examined.

The explanation, as given us by microscopic investigation, is so natural and so simple that these apparently wonderful cases no longer astonish, and the wide difference in the results observed and reported is no more than we should expect from the varying peculiarities and conditions in individual cases. It is the remnant of ovarian stroma, however little, which has been left in the pedicle, or such of the ovarian tissue as was not removed, and which was not destroyed, which continues its activity and determines the following menstruation or conception *if healthy*, and the suffering generally referred to the ovary *if diseased*. These particles may survive or they may be destroyed by consequent inflammation or necrotic disintegration, or absorbed in a process of retrograde metamorphosis.

I will briefly detail two very striking cases, from my own practice, which clearly demonstrate that, if some of this stroma remains in the pedicle after double ovariectomy, the tissues of the patient be healthy, and her constitution good, this small remnant of ovary continues its activity and performs all the functions of the entire organ; that menstruation is not interfered with, and fecundation is possible.

The operation for removal of the appendages is generally performed on account of the suffering caused by diseased ovaries, and we operate under the most varied conditions, upon morbid structures often intimately blended with the surrounding parts; some of this tissue may be left *in situ*, however careful the surgeon may be, because in these cases the diseased organ is often firmly imbedded in the surrounding tissues, agglutinated with them, and difficult of removal. Strange as it may seem, it is a fact that such shreds, or parts of diseased ovarian tissue, may continue to perform the functions of the intact viscus, and, to a certain extent, give rise to symptoms similar to those which have been occasioned by the diseased organ itself; wherever it is possible to *remove com-*

pletely all ovarian tissue *menstruation* ceases, and this continuance of the aggravating symptoms is not likely to be found.

Let us no longer theorize as to the origin of such symptoms after oöphorectomy or of continued menstruation after double ovariectomy, but let us search for facts.

Several cases of this kind have been recorded, and one of the most striking of these I will mention, as it coincides strangely with one observed by myself, occurring at the same time and published at the same time.

I performed ovariectomy in April, 1880, upon a patient who continued to menstruate and who was delivered of a healthy child in August, 1884; and Prof. Schatz, of Rostock, reports a case identical in all important details, upon which he operated in February, 1880, who was delivered in May, 1885. I will briefly recall the more important facts in my case, which was published in full, with others, in a paper on "Ovariectomy: Its Difficulties, Diagnostic and Operative. Continued Menstruation after Double Ovariectomy" in the *American Journal of the Medical Sciences* for April, 1882. (The case was also recorded in a paper read before the Medico-Chirurgical Society of St. Louis, November 28, 1881.)

CASE I.—Mrs. T., from Kansas City, consulted me in April, 1880, on account of failing health due to an abdominal enlargement of less than a year's growth. She was thirty-two years of age, mother of five children, the youngest being two and a half years old; she first menstruated in her thirteenth year and was regular ever after, suffering no pain; her labors were easy and recovery rapid and complete. After the development of the tumor the menstrual flow continued regular, but more profuse than formerly, being very free and continuing for seven days, instead of four days, as usual.

On Thursday, April 22, 1880, I operated, in the presence and with the assistance of Drs. Prewitt, Schenck, Engelmann, Sr., Nelson, and Fischel. The operation presented some peculiar features: a fan-like expansion of the bladder to within an inch of the umbilicus; adhesions of the greatly thickened omentum to the tumor, bladder, and abdominal wall, with the presence of a

dozen or more small peritoneal cysts, many with pedicles six or eight inches in length, pendent from the peritoneal covering of of liver, diaphragm, and intestinal tract. The tumor was a uniform, colloid mass, somewhat more consistent toward its circumference, but not enclosed in any distinct capsule, of an appearance very much like an orange water-melon, and of similar size. Being too large to be removed through the opening, too soft to be cut to pieces, I was obliged to claw out this glutinous mass by the handful after dragging the tumor into the incision with the patient upon her side; the long pedicle was tied and dropped, the tube blended with the tumor being completely removed. This was upon the left side. The right ovary with a cyst the size of an orange was also tied and removed, the tube being left intact. Recovery was uninterrupted by any untoward symptoms, and she has enjoyed the most perfect health ever since, menstruation continuing with perfect regularity.

Patient had menstruated last, prior to the operation, on the 15th of April, 1880; on the 22d I operated; the next flow appeared May 18th, and was quite profuse for four or five days; this was five weeks after the last normal menstruation. Three weeks later she again became unwell, Thursday, June 10th; this was resuming the early habit, and returning into the well-worn groove of the previous unusually regular menstrual cycle, the flow appearing at the regular time as was her habit before the operation. She experienced very little backache, no pain or discomfort, and the discharge was free. The next period appeared on the 10th of July, lasting until the 14th; then came a slight flow from July 30th to August 1st, and again August 10th to 11th. For a few months the flow became very scanty, but was accompanied by no pain and but very slight backache. I naturally supposed that the discharge would grow less, and, finally, cease; but, on the contrary, after this slight irregularity, menstruation again became normal and regular, and so continued to the beginning of November, 1883, when it ceased, and soon after my patient complained of peculiar symptoms, stating that were she not conscious of the fact that both ovaries had been removed she would suppose herself pregnant, judging from the similarity of her symptoms to those in the early days of previous pregnancies. Menstruation did not return, and the abdomen enlarged; local

portion of its tissue became distended and was dragged out, if not into a pedicle, yet losing its well-defined margin.

CASE II.—Case of Prof. Schatz, of Rostock (*Centralblatt für Gynäkologie, and Obstetric Gazette*):

On February 20, 1880, Prof. Schatz removed a large cystic tumor of the left ovary, including the outer third of the Fallopian tube and all the ovarian tissue that could be found. The right ovary was of the size of a walnut, and showed signs of cystic degeneration; it was tied by means of three silk ligatures passed between it and the broad ligament, and was cut away in such a manner that a *piece of ovarian tissue, at the most two millimetres broad, was left on the proximal side of the ligature; the right tube remained intact.* On March 21st, when the period was due, the patient was seized with a paroxysm of pain in the right side of the hypogastrium and right thigh, with vomiting and high fever for four days; these symptoms recurred on April 8th, and again on May 8th, when the pain extended to the left hypogastrium. No deposit could be detected in the pelvis. The first show appeared on May 9th; it lasted three days, pale and scanty, recurring on May 31st; in the interval, attacks of pain occurred in the inguinal region. On June 11th a swelling about the size of a plum was detected behind and to the left of the uterus, which was ante flexed. On June 28th severe sacral pains came on, which radiated to the left inguinal region and disappeared at the coming of the period, which was copious and lasted six days. On July 15th the uterus was found to be small and retroverted. Henceforth the catamenia appeared regularly up to the patient's marriage in April, 1884. In the early part of August the last menstrual flow occurred, and symptoms of pregnancy became marked in September. May 12, 1885, labor set in, lasting thirty-six hours, terminated by the forceps.

The right ovary had been preserved, and the cut surface, upon examination, was found to contain ovarian tissue with Graafian follicles. The tumor of the left ovary was also subjected to a thorough examination, and as the terminal portion revealed no ovarian tissue, it was evident that the entire organ had been removed.

A reviewer in the *Obstetric Gazette* truly says that "this

physicians consulted claimed a healthy pregnancy; my own opinion, without seeing the case, was that a malignant tumor was in progress of development, since I knew so well how thoroughly the tumor was pedunculated and how completely both ovaries had been removed. Toward the end of the fourth month all doubts of the anxiously expectant woman were solved by the feeling of motion, which gave her the happy consciousness of being soon about to become a mother, and brought relief from the dread fear of a new tumor. August 16, 1884, nine months after the cessation of the menstrual flow, a healthy boy baby appeared, and solved all still remaining doubts of wondering friends and observant physicians.

Mrs. T. recovered thoroughly and speedily from her confinement, and the remnant of ovarian tissue did not long remain idle, for four weeks after labor menstruation returned, and has then continued with perfect regularity.

The key to the situation is the remnant of the cystic right ovary, which I had believed to have removed *in toto*.

The left ovary had completely disappeared in the large colloid tumor, which had a very long and slender pedicle, cut near its uterine end, hence it is not probable that any ovarian tissue remained on this side, and moreover the tube was completely removed. The right ovary was in its normal position, and from it had developed a cyst of the size of an orange, by which the ovary had not yet been destroyed, and which had not yet stretched the tissues to any extent, so that no real pedicle existed. The ovary was ligated and removed as in oöphorectomy, so that it is possible that a little of the tissue may have remained on the distal side of the ligature. The tube on the right side remained intact, and is not visible in the specimen. In an earlier paper I made the erroneous statement "that the specimen in my possession precludes the possibility of a part of the ovary having remained *in situ*, and thus accounting for the continuance of the flow."

Microscopic examination reveals ovarian tissue upon the cut surface, the ovary having been inflamed and enlarged, and, as the cyst developed, it was dragged upward, then a

case proves the necessity of a very thorough removal of the ovaries when oöphorectomy is performed for the cure of bleeding myomata of the uterus, and that it is evident that fimbriae of the Fallopian tubes can lie in contact with a mere trace of ovarian tissue as well as with an entire ovary," and, furthermore, we see that a mere trace of ovarian tissue, like a few epithelial scales upon a granulating surface, may develop the full functional activity of the organ from which they spring.

The similarity of the two cases here related is striking; in both the left ovary had degenerated, and the large tumor which was removed was well pedunculated; in the right ovary the disease was but incipient. In my case a cyst the size of an orange was found; in that of Prof. Schatz a mere cystic degeneration of the ovary was in progress, and the organ itself seems hardly to have exceeded its normal size, as he says it was of the size of a walnut, and no pedicle presented, hence in the removal a small segment of ovarian tissue was left, as frequently happens in the operation of oöphorectomy. In my case menstruation was not interrupted by the operation, but continued almost normal, growing somewhat more scanty after some months, but without presenting any striking features, and this is probably due to the fact that I did not interfere with the broad ligament or tube of the right side, but tied the ovary in the pedunculated portion; whilst the operation of Prof. Schatz was an oöphorectomy, and the ligatures which passed through the broad ligament must have disturbed the relation of the tube and the remaining ovarian stroma; hence menstruation was inaugurated with decidedly abnormal symptoms. At the first period a flow did not appear, but vomiting and high fever, accompanied by paroxysms of pain in the right side and thigh. May 9th and 31st a very slight, scanty flow appeared; natural conditions evidently being approximated; the lymphatic deposits about the tube and ovary probably being absorbed. On June 11th, the fourth menstrual period, a swelling the size of a plum was detected behind and to the left of the strongly anteфлекed uterus, evidently a small hæmatocele. Upon the fifth return, June 28th, severe

sacral pains appeared, but vanished with the copious flow, which continued for six days. Finally, July 15th the uterus was found small and retroverted, and henceforth the catamenia appeared regularly up to the patient's marriage; plastic exudation had been absorbed, the tubal opening and ovarian remnant approximated and restored to a healthy state, so that menstruation was no longer interfered with.

CASE III.—Mrs. H., aged thirty-one, married eleven years, sterile, suffering from nervous and physical prostration, consulted me first in February, 1888. She had been confined almost entirely to her room for the past year, suffering severe pain from the slightest jar, so that she could walk but short distances at a time. Patient has suffered intensely for the past eight years, but complained of pelvic pain even before her marriage. The menses appeared in her seventeenth year, usually lasting four or five days, always very regular, without pain, but of late years they have recurred every three weeks and continued profusely for five days, but still without pain, unless their appearance should have been retarded. One week after the cessation of the flow a bloody, watery discharge, which was also seen after any slight physical exertion, appeared and continued for four or five days.

Examination revealed a uterus slightly retroverted and flexed, but little enlarged, low in the pelvis, with an endometritis polyposa; the right ovary was found enlarged and retro-displaced; a large cystic body was distinctly felt to the left and somewhat behind the cervix, with a small indurated mass, apparently an inflammatory product, in the broad ligament, which proved to be the ovary, whilst the cyst to the side of the cervix proved to be the dilated tube. This explains the pain which was caused by every jar, every step, and also the pain upon intercourse, which was unbearable for the past eight years, but had existed even when she first married, eleven years ago.

A six months' treatment, with rest, tonics, and hot douches, served to keep the patient comfortable, but in nowise altered the existing conditions. As soon as she exerted herself in the slightest degree all previous pains returned. Removal of the diseased appendages was advised and undertaken in April, 1889, this brave woman coming to the city alone determined to seek relief.

The right ovary was found enlarged, retro-displaced: the right tube thickened and dilated. The greatly distended left tube was found low down in the pelvis to the side of the cervix, whilst the ovary was a small, contracted, indurated mass, firmly adherent, like an inflammatory product, to the broad ligament, appearing precisely like a small exudate. The only difficulty experienced in the operation was the removal of this ovary, which I could not dissect off, but was obliged to cut away from the broad ligament with my finger-nails, and so left small fragments of ovarian tissue adherent to its peritoneal covering. Recovery was normal, and the patient returned home with the expectation of now being relieved, not alone of her suffering, but also of the annoying recurrence of the menstrual flow.

October 15th, seven months after the operation, I received the following report: Mrs. H. is in excellent health; has gained over twenty pounds; has a perfect complexion; feels better than at any time since girlhood; walks as well as ever; menstruation is regular, but profuse (evidently due to the hyperplastic condition of the endometrium, which was not interfered with in any way), lasting almost one week; sexual intercourse is no longer distasteful, and she is entirely free from pain during the act, which has never been the case during the eleven years of her married life. Her only complaint is a leucorrhœa, which has not been improved. She feels perfectly well and strong, and is annoyed only by vaginal discharge and a slight weakness during the period and some days after from the somewhat profuse flow.

Examination of the appendages shows a complete removal of the enlarged ovary and tube on the right side, removal of the tubal sac on the left and the contracted ovary on the same side, with the exception of its serous surface and particles of ovarian stroma in the part adjacent and adherent to the broad ligament.

Microscopic examination and careful observation having taught us in these cases the true state of affairs, we can now readily explain the varying symptoms of each, and the numerous mysterious cases of menstruation after double ovariectomy and oöphorectomy, and those annoying cases of imperfect results following the supposed removal of the diseased

ovaries. It has long been known that it was not always possible to remove, even with the greatest skill, the entire mass of ovarian tissue which was imbedded in pathological formations and agglutinated to surrounding organs. It is evident then that with the slightest remnant of ovarian stroma, a few follicles may determine a continuance of the menstrual function. On the other hand, it does not follow that the *remnant* of ovarian tissue which is left in the pelvic cavity *must develop* the functional activity of the ovary, and this is natural: in some cases where an active circulation exists, in healthy tissue, the pedicle remains large and full, forming a smooth, rounded surface; in others a retrograde metamorphosis with shrinkage, and even necrosis of the upper portion, takes place. In those cases in which ovarian tissue is left in the pedicle we will have, in the first instance, continued menstruation and functional activity in such ovarian tissue; in the second, in which retrograde metamorphosis or necrosis takes place, we would find the sequence naturally to be expected from the removal of both ovaries, that such functions and symptoms which we trace to that organ disappear after the operation. And such are probably the cases reported by Schröder in the paper in which he describes those ovariectomies in which he purposely left a part of the ovary. Five of these recovered, though pregnancy did not occur in any of them; either sufficient time had not elapsed since the operation, or the nutrition of the tissue left in the pedicle was insufficient to preserve life and functional activity, if it had not become encysted or absorbed.

I will here add a fourth case, bearing indirectly upon the subject, the result of an observation recently made which must seriously influence the importance of oöphorectomy in cases of nervous suffering.

CASE IV.—*Pain caused by disease of uterus or ovaries is not necessarily relieved by removal of the offending organ.*

This was exemplified in a remarkable manner by a patient from whom uterus and ovaries had been removed on account of a sarcoma; her general health was greatly improved, but nervous

symptoms, pain in the head, referable to uterine and ovarian disturbance, disappeared for a short time after the operation, then returned and grew worse, and were aggravated by pains in ankles and heels, so frequent in women, which grew so severe that patient could hardly walk. Sent to a neurologist, the trouble was treated as peripheral by electricity applied to head and feet; temporary relief was afforded, but the pains returned, when she was placed in my hands. I treated her as if the suffering were a hystero-neurosis, by vagino-abdominal galvanism, the negative, cotton-covered ball electrode in the vagina, and the medium abdominal plate with the positive pole on the abdomen, over the site of the fundus, and immediate relief was afforded; the pain completely disappeared after the third application of thirty milliamperes for five minutes. The centre of pain was evidently in the extremity of the same nerves which had previously carried it, a phenomenon similar to the feeling of pain in the toes after amputation of the leg.

To what influence are the hemorrhages which occur after the removal of the ovaries to be ascribed? Are they physiological or pathological? Are they a continuance of the menstrual flow, or are they intermittent bleedings? Our best operators and most progressive gynecologists are still at war in regard to this very point; so bitter is the strife that Mr. Lawson Tait refers to it in the following words in the presidential address delivered before the British Gynecological Society, January 12, 1887; he says: "It is most amusing to hear Sir Spencer Wells and Mr. Knowsley Thornton insist that for the arrest of menstruation by operation every scrap of ovarian tissue must be removed."

The subject was prominently referred to in the discussion of Dr. Hoffman's paper before the Philadelphia Obstetrical Society in its meeting in September, 1889, and the frequency of such hemorrhages was acknowledged by all who took part in the discussion, being referred to habit by some, and explained as a safety valve by others. In one of these cases in which monthly bleeding recurred after the removal of both ovaries by Dr. Hoffman, Dr. Baldy some months later

curetted the uterus and found malignant disease. Dr. Hoffman has likewise stopped this apparent menstruation—this monthly recurrence of bleeding—by the curette and other appropriate treatment, thus demonstrating that it was not a menstruation, but a bleeding, caused by hyperplasia or by hypertrophy of the uterine mucosa.

I refer to these discussions because whatever the reasons assigned for the bleeding, an analysis of the cases there reported distinctly proves the assertion made that this bleeding is not a menstrual flow correctly speaking, although it does occur at more or less regular intervals; the bleeding occurs, *provided that conditions favoring hemorrhage exist in the uterine tissue*, and it appears when the impulse is given by the remnants of the ovarian nerves or ganglia, any irritation of which will result in a partial revival of the great functional wave which controls female life from puberty to the menopause. In many cases, hitherto crudely reported, careful observation and examination would undoubtedly have revealed a distinct cause, and demonstrated that it is either menstruation, and that ovarian remnants are retained, or that it is a bleeding due to pathological conditions of the uterine mucosa. In this advanced period of medical science, we should no longer fall back upon such vague explanations as habit or safety valve, when for want of facilities for investigation we are unable to determine the precise cause.

A careful investigation of this subject has recently been made by Glawecke ("Physical and Mental Changes After Removal of Both Ovaries, and After Extirpation of the Uterus," *Arch. f. Gyn.*, xxxv. 1), based upon a large number of cases from the records of prominent operators, and in eighty per cent. of the cases in which both ovaries were removed he finds that menstruation ceased at once or after a short time; in twelve per cent. of the entire number a bleeding at rare intervals, and in small quantities, continued for a time; in some few a substitute for menstruation, which he calls atopomenorrhœa, appeared. In one-half of the cases molimen recurred, perhaps the result of the remaining con-

gestion, or due to irritation from nerve centres. The phenomena of the menopause were present almost invariably: hot flushes, sweating, etc., atrophy of uterus and vagina usually occurred, nutrition improved, the patient grew stout; in short, a climacteric followed the operation which was very much like that which occurs naturally, and all the data serve to verify the fact that the impulse of menstruation proceeds from the ovary, and consequently the period ceases when the determining force is removed.

The apparent disparity of results, the widely differing explanations given for apparently similar results—results not fully understood, or misinterpreted—and the lack of post-mortem records, have caused this great divergence of opinion. In many cases in which the ovaries, to the certain knowledge of the operator, have not been completely removed, menstruation ceases, because that part of the organ which remained in the distal end of the pedicle has atrophied or sloughed, and has so been destroyed, notwithstanding that, to the best belief of the operator, the organ in part remains; hence he cannot well explain the symptoms, the cessation of the flow, notwithstanding the remnant of ovarian tissue. Again, the operator, as in my case, is convinced that the ovaries have been completely removed; he may even have the specimen to verify his belief, yet menstruation continues. He naturally concludes that menstruation has nothing to do with ovulation; but if he subjects the specimen to examination by a competent microscopist he will find that the capsule is not intact and that some shred or scrap of ovarian tissue has been left *in situ*, and even if beyond the ligature, as in my case, this may develop functional activity and menstruation continue; conception may even take place if the tube is preserved. No part of the pedicle has suffered, but even its extreme end beyond the ligature has preserved its vitality, and proliferation may even take place. Then in this patient, from whom *to the best belief of the surgeon, the ovaries have been completely removed, the functions continue*, and he frames a theory in accordance with what he takes to be the fact. I may add my

own belief that in some cases of undoubted complete removal of the ovary a partial menstruation may continue for a time by reason of the influence upon the uterine plexus exerted by the remnants of the ovarian nerves, which, under peculiar circumstances, may still automatically perform their functions, precisely as they did whilst still influenced by the ovary before its removal, provided that the uterine tissue is in a condition favoring hemorrhage. Why should not the bisected ovarian nerve, the stump with its terminal fibres removed, still continue to convey the habitual impetus, precisely as we have seen in the case mentioned, former uterine pains still made evident in distant parts after the uterus and the irritated terminal fibres had been removed? Or as the old soldier, whose leg has been taken off at the hip, is made conscious of the pains in the lost foot by the activity of the fibres in the stump of the sciatic nerve?

I believe that the case I have here recorded, together with that of Schatz, affords a solution of the problem which must be settled by the microscope and the scalpel, but never by the pen.

CONCLUSIONS.—In considering the question of the cause of the persistence of menstruation after the removal of both ovaries, we must bear in mind the more important of the reasons assigned:

1. Habit.
2. The presence of a third ovary.
3. Remnants of ovarian tissue left *in situ*.

Some have ascribed the cause of persistent menstruation to habit—an explanation which I do not accept, and which cannot be admitted even when it is a regularly recurring and persistent flow with the undoubted characteristics of menstruation.

Morbid activity, or irritation of the spinal or ganglionic centres, or of the bisected nerve termini, may serve to explain recurrences of uterine hemorrhage for a time, but habit is a term which must be excluded from any scientific discussion of the question.

We do know that uterine hemorrhage frequently occurs soon after operations on the pelvic viscera, especially after laparotomy, evidently due to the congestion caused by the disturbance of circulation, and if the spermatie and other supplying vessels are cut, by the increased flow to the remaining arteries, especially the uterine.

We also know that bleeding, simulating menstruation, occurs under various conditions without ovarian activity, thus from the congested or subinvolved uterus during childhood in old age, if the tissues are relaxed, or if the endometrium is in a state favoring hemorrhage, with an endometritis polyposa or hemorrhagica; in many of these cases in which the appendages are removed, or ovariectomy is performed, a diseased, congested, or enlarged uterus exists, and by reason of the ligation of numerous vessels the flow of blood through the uterine artery is increased, and in such cases in the already congested organ the habitual influence of the menstrual wave, of the uterine flood, in obedience to the irritation arising from the nerve stump or the spinal and ganglionic centres, may suffice to cause an increased pressure and a flow of blood at intervals, especially at the times when menstruation should have occurred, but this will never persist for any length of time.

It is in this class of cases, with a uterine status favoring hemorrhage, that the disappearing wave of the uterine flood, or, more correctly speaking, the influence exerted by the ganglia and nerve stumps, the condition vaguely and improperly called habit by some, will lead to the semblance of menstruation, but never to a normal and persistently recurring flow.

It is now well known that a third ovary does occur, although only a myth until 1863; one such case, and another of an accessory ovary, is pictured by Winckel. Olshausen, Klebs, and others have observed and published isolated cases, but notwithstanding all the numerous laparotomies of late years by competent observers, no one has met with a third ovary except Olshausen in the removal of an ovarian cystoma. Continuance of menstruation after the removal of both ovaries has been repeatedly reported, and the presence of a third

ovary so rarely, that *a priori* we must conclude that an additional remaining ovary cannot ordinarily be accepted as an explanation for this phenomenon.

Whilst the present status of our anatomical and physiological knowledge will not admit of either of the above explanations, it is fully in accord with the facts observed in the cases reported, which conclusively prove that the continuance of menstruation—undoubted menstruation, regular and persistent—is due to the presence of ovarian tissue, however small in quantity, and wherever it may have been left.

From the history and microscopical examination in my own cases and in that of Prof. Schatz, we may safely draw the following *physiological conclusions*, which are corroborated by numerous cases of oöphorectomy and of double ovariectomy now observed, the histories of which have been recorded for a sufficient length of time after recovery from the operation :

1. That the continuance of *menstruation* after removal of both ovaries is due to remnants of ovarian stroma left *in situ*.

2. That particles of ovarian tissue, however small, which remain after the removal of the greater portion of the organ, whether or no the Fallopian tube be preserved, *may* retain their activity and continue the functions of the entire organ ; and from this we infer that menstruation is more or less intimately associated with ovulation, and that the menstrual condition indicates the ovarian status, provided the uterine tissues be normal in character.

3. That remnants of ovarian stroma do not *necessarily* preserve their vitality and functional activity.

4. That even elongated pedicles may contain ovarian stroma in which the functional activity of the organ may be continued.

5. That the ovary is an essential factor in the functional life of woman, and that menstruation and healthy ovarian activity, are inseparable.

The deductions of practical value to the operator are as follows :

1. If menstruation is to be checked, and the change of life produced, it is requisite that every particle of ovarian stroma shall be removed, if the result desired is to be expected *with certainty*.

2. If shrinkage of fibroids, limitation of hemorrhage, or cessation of annoying symptoms is to be accomplished with the greatest possible certainty, both ovaries must be *completely* removed.

3. In the performance of double ovariectomy (not oöphorectomy) in women not yet beyond the climacteric, and not suffering from uterine reflexes, such healthy ovarian tissue as may exist should be spared in order that functional activity may not be impaired.

